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Instructional Technology Research in Japan: Policy and Framework

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1. Definition of Instructional Technology

In Japan the meaning of "Instructional Technology" is understood in a variety of ways. Some regard it as technologies for the instructional use of media and others consider it as a systematic approach to design, implement and evaluate instructional processes.

In the 1970s, the topic was widely discussed, but nowadays, it seems that the following goals are generally accepted among Japanese researchers and educators.

1. to pursue an optimal combination of the components in the teaching-learning processes.
2. to develop and use the technologies, media and systems that are most useful for implementing these optimal combinations.
3. to organize the technologies, media and systems as a science of technology concerning instruction.

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2. Overview of the Environment for Instructional Technology Research

2.1. Academic Societies and Professional Associations

In Japan, there are several academic and professional societies and associations for instructional technology. Among them, the Japan Society of Educational Technology (JET) was established in 1984, to function as a core of educational research groups.

The first national joint conference of educational technology societies was held in Kyoto in 1985. Four different societies joined and another four supported the meeting. More than 750 researchers and educators participated to discuss many topics on educational technology most of which are related to instructional technology research and development.

The Academic societies are the JET, the Japan Society of Science Education, the Japan Society for the Study of Audio-Visual Education, the Japan Association of Broadcast Education, the Society of CAI in Japan, the Technical Group on Educational Technology, the Institute of Electronics and communication Engineers of Japan and the Japan Society of Educational Methods.

The professional associations are the Japan Association of Educational Technology (JAET), the Japan Association of Educational Information, the Japan Council of Educational Technology Centers, the All Japan Association of Audio Visual Education and the All Japan Association of Broadcast Education.

Activities in these academic societies are research oriented and activities in professional associations are practice-oriented. Each of them has an annual conference. Many researchers and teachers participate as members and attend several meetings to study educational technology.

2.2. Academic and Popular Journals and Magazines

Many academic and popular journals and magazines are published. Most of academic societies publish the proceedings for annual conferences. Besides these each academic society

publishes their own academic journal or magazine from one to four times a year.

The JET publishes Educational Technology Research twice a year in English. One number includes abstracting articles on educational technology research and development into English. Most of instructional technology research papers in Japanese are published in the following academic journals.

1. Japan Journal of Educational Technology (Four numbers in one volume)
2. Journal of the Society of CAI in Japan (Four in one volume)
3. Journal of Science Education in Japan (Four in one volume, one of which is published in English)
4. Japanese Journal of Audio Visual Education (once a year)
5. Japanese Journal of Broadcasting Education (once a year)

Several popular journals concerning instructional technology for teachers are also published every month or every two months. These are Audio Visual Education, Education by Radio and TV, Practices in Microcomputer Education, Education and Information, and New. The monthly magazine, "Education and Information" was edited by the Ministry of Education, Science and Culture and "Practices in Microcomputer Education" is edited by a non-profit educational organization called the Association of Science and Technology Education. Other journals and magazines are edited by private book companies.

2.3. Diffusion of Media and Budget

As the diffusion of instructional devices and equipment is concerned, OHP and TV are most popular and well utilized in Japanese primary and secondary schools, as almost of schools have them.

Table 1 shows the diffusion rate of new media in Japanese public schools. Micros are now introduced in 2% of primary, 13% of secondary and 81% of high schools. These figures are lower than other advanced countries such as U.K., U.S.A., Canada, Singapore, Korea and France.

By the fiscal year of 1984, 34 items of instructional media

for primary schools and 33 for secondary schools had been recognized as Educational materials and equipment standards by the Ministry of Education, Science and Culture. New media were not included. The purchase of these items had been supported by the special budget from the central government. The amount was 14 billion yen (US\$ 78 million) a year in total.

However, in 1985, this special budget from the central government was transferred to the block funds which local boards of education could use more flexibly for any kind of educational programs.

After the fiscal year of 1984 finished, it was obvious that the amount spent for purchase of instructional media in almost all prefectural boards of education was greater than the available budget.

The Ministry of Education, Science and Culture also provided 2 billion yen (US\$ 11 Million) for subsidizing half and one third of the expenses by which local boards of education could buy new media for primary and middle schools, and high schools respectively.

In 1985, approximately 5,000 micros were purchased using these funds.

2.4. Recent Trends in Governmental Policies

As Recent as 1985 the Ministry of Education, Science and Culture started to express a positive attitude towards introducing microcomputers into schools. Seven different divisions now have different programs concerning "micros in education".

Firstly, the Division of Learning Information Resources is responsible for serving the Commission on Social Education. The Subcommittee of Educational Media (formerly called educational broadcasting) presented "The Report on Educational Use of Microcomputers in Schools" and showed the general guideline of introducing micros in Japanese education. The subcommittee also presented "The Report on the Guideline for Developing Educational Software", and showed remarks, suggestions and recommendations

for developing educational software to educators and educational industries. This Division also conducted a program, called "Development of Audio Visual Instructional Materials" and promoted educators to make educational software in seven prefectures.

Secondly, the Division of Secondary School is responsible for serving the Task Force on the primary and secondary education in an information society. The Task Force presented an interim report and described the philosophy and directions for introducing micros into primary and secondary schools.

Among programs undertaken by other Divisions in the Ministry of Education, Science and Culture, there are "Special Research on the Improvement of School Education", "Research on Instruction for Individual Difference", "Research on Educational Facilities Adaptable for Varieties of Educational Methods" and "Research and Development of Network System for Educational and Cultural Information". In addition, the matching funds mentioned above and "Research and Development Project on Educational Devices and Equipment" are conducted by the Division of Financial Affairs.

The Ministry of International Trade and Industries are also interested in introducing micros into schools and will establish "the Center for Microcomputer Education" in 1986.

3. Categories of Instructional Technology Research

Various aspects and topics have been treated in instructional technology research since 1970s. Titles of instructional technology research in main academic journals for these five years can be classified into the following six categories of research fields.

1. Teaching
2. Learning
3. Media
4. Subject area
5. Special Education

6. Media Literacy including Computer Literacy

In the Abstracting Japanese Reports on Educational Technology Research into English undertaken by the Center for Educational Technology, at Aichi University of Education, approximately 250 articles with English abstracts presented during the period from 1980 to 1984 are listed in the Educational Technology Research since 1980. These figures were obtained after eliminating the articles without English abstract and articles irrelevant to educational technology.

Table 2 shows the percentages of papers which belong to each category. Thirty five percent of the papers concern studies on "Teaching", 15% relate to "Learning", 35% investigate "Media", 10% study instructional technologies in subject areas, 3% relate to "special Education" and 3% concern "Media Literacy".

The figures in 1985 were obtained from the papers presented in the first joint conference of Educational Technology in Japan. In the proceeding of the joint conference 167 papers are included.

Among them, 30% of papers treated the study on "Teaching", 5% related to "Learning", 40% investigated "Media", 10% concerned "Subject Area Studies", 5% related to "Special Education" and 10% concerned "Media Literacy". Thirty five percent of these papers presented in the joint conference involved microcomputers. The decrease in "Teaching" studies in 1985 was due to the decrease in studies on microteaching and practice teaching. The increase in "Media" and "Media Literacy" seems to have been caused from increase of papers concerning microcomputers.

4. Competencies Required of Specialists in Educational Technology

An interesting survey was conducted on competencies required of specialists in educational technology by Imae, et al (1985). The questionnaires were mailed to 1,589 members selected from academic societies on educational technology and usable replies were received from 563 (35.4%).

Table 3 shows the summarized results. Five areas of competences required of specialists in educational technology were found, i.e.,

1. Instructional Design and Research
2. Media Production and Equipment Operation
3. Research
4. Educational Systems Development and Management
5. Basic Knowledge of Education

Primary competencies for specialists in schools and education centers are "Instructional Design and Research" and "Media Production and Equipment Operation". On the other hand, the primary competency for specialists in universities and research institutes is "Research", and secondary competences are the remaining four factors.

5. Review of Reviews

5.1. General Overview on Educational Technology

Several papers described the state of educational technology in Japan before 1980 in English (Sakamoto, 1975, 1977, 1978). One paper was published in the International yearbook in 1978, so researchers in foreign countries have easy access to it. Shortly after a brief article (Sakamoto, 1980) was written in the US magazine, "Educational Technology" and this article described the main streams of research and practice in educational technology in Japan at that time. It concluded that the utilization of educational technology both in terms of software and hardware was advanced at the primary and secondary school levels and that many difficulties still remained in the utilization of educational technology.

Problems were (1) the lack of interests and motivation for instructional improvement among many university professors, (2) the fact that practical studies are undervalued in the main stream of educational research, (3) the lack of value attached to educational technology by academic society generally and (4) the

difficulty of empirical research.

During the past five years, the situation has gradually changed in a number of ways:

First, the number of university professors who are interested in university teaching technologies is increasing. A number of books on technology, originally published in the U.K., were translated into Japanese by Japanese professors. Many university professors who belong to teacher training universities are now undertaking studies concerned with improving instruction.

Second, practical research papers are now presented in academic conferences and published in journals on educational technology.

Third, an academic society for educational technology was established and a joint annual conference was held in 1985.

Fourth, empirical studies are undertaken by many more researchers, although they have still difficulties.

5.2. Reviews on "Teaching"

Reviews on each study field were presented in research journals and booklets. Sakamoto (1981) described the problems of teaching methods in terms of technological innovation at university levels and found that very few universities and colleges were involved in studying this problem. Inoue et al. (1980) divided micro teaching into six structural elements: micro classes, micro lessons, feedback techniques, modeling, relessoning, and the role of teacher education. They analyzed each area and then compared them.

5.3. Reviews on Media Studies - Audio Visual Materials

As for media studies, there are many reviews on the use of educational TV and microcomputers. Most of them are written in English and some were published in foreign countries.

Inoue, et al. (1982) described the national standards for teaching materials and equipment, their diffusion rates, audio visual libraries, use of broadcasting in social education and use of audio visual media in industries.

Articles published in English by JAVIC, Japan Audio-Visual Information Center, Japan Audio-Visual Education Association are also informative. "Audio Visual Education in Japan" was published in 1983, "Educational Use of New Media in Japan" in 1984, and "Non-Commercial Audio Visual Instructional Materials in Japan" in 1985, are recent examples.

Educational Radio and TV are very well utilized in kindergartens, nursery schools, and primary schools. The results of a utilization survey were summarized by Akiyama, et al. (1981) and research reports on ETV for young children were also reviewed by Sakamoto (1981, 1984). In the 1984 paper he described imitative behaviors stimulated by television in 0 to 3 year olds studied by the NHK (Japan Broadcasting Incorporation).

TV and Radio are also utilized for adult education in Japan. Nishida (1981) reviewed research on the University of the Air during its introductory period. Audience analysis for the experimental pilot programs and studies of the effectiveness of ETV, correspondence and computerized tests were described.

The university of the air project was also summarized in two articles published respectively in the U.K. and Canada (Sakamoto, 1980, 1982). Among the survey results, it was found that 60% of respondents wanted to learn in the University of the Air. "Health and Diseases", "Food, Clothing and Housing" and "Education" were the most demanded courses. There was evidence that correspondence tests and schooling increased academic achievement and decreased dropout rate. The contribution of schooling and computer aided correspondence tests on the final achievement score were found to be equal to an increased of 35 points on a 100 point exam in "Science of Structure and Materials" and 15 points in "The World of Japanese" course when compared to the points in scores without using them.

5.4. Use of Microcomputers

The educational use of microcomputers in schools is now the most popular topic in Japan.

Several surveys of the research on microcomputer use in

schools have been published. Kikukawa (1981) reviewed (1) the state of development in CAI, CMI and Information Retrieval Systems, and (2) the use of microcomputers in teaching behavior analysis, special education, information education, technical training and individual instruction.

Sakamoto et al. (1984) also reviewed the recent trends of research works on microcomputer use in education. He focused on three main categories of the use of microcomputers:

(1) as educational objectives and content, (2) as a means for processing data on educational research, and (3) as a tool for educational practices. He found that 378 reports were published or presented in academic journals and societies over the past three years and that most of them, 77% were concerned with the third category. These two papers are written in Japanese, but another three are available in English (Sakamoto, 1981, 1984, Horiguchi, 1983). Since the two Japanese papers describe the state of use and research in 1983, the content is now partially obsolete, but interesting descriptions are found in their concluding remarks. They describe a considerable number of research and development projects which were still in an experimental or developmental stage. They also note that many teachers are not always interested in computer based teaching. Sometimes they reject the innovation.

Horiguchi, et al. (1983) also reviewed the CAI research and development in Japan since 1977. Approximately 350 CAI research reports were abstracted and reviewed in terms of the following three categories: (1) Hardware, (2) CAI Software and Courseware Design, and (3) Courseware Evaluation and CAI Utilization and Management. Most research focuses on the development of hardware, software, courseware and systems. Very few studies are concerned with the effects of CAI on cognitive skills, achievement and abilities in students. After describing the present state of CAI research they summarized problems facing future CAI research: "It is clear that, in company with this metamorphosis from a paradigm based on behaviorism/drill to one based upon cognitive development, the cutting edge of research

has moved from traditional CAI towards intelligent CAI, which incorporates the results of developments in artificial intelligence or even towards knowledge engineering oriented CAI. In Japan, also, artificial intelligence, cognitive science, knowledge engineering and so on, are now being related to CAI research. Further, researchers in CAI are cooperating with the national "Plan for Development of the Fifth Generation Computer". It may be felt that things are moving us in these directions very rapidly".

6. Examples of Research in Instructional Technology

Since many studies have been published, the following criteria for selecting examples were employed, (1) The papers should report not only the development of technologies, systems, hardware, software and courseware, but also include the evaluation of effectiveness on teacher and/or children's behaviors, and (2) The papers were "peer reviewed".

6.1. Teaching

Out of 90 articles produced from 1980 to 1984, 9 studies are related to instructional design, 26 to instructional skills, 21 to practice teaching and 12 to micro teaching. The main focus of instructional design studies seems to be on an automatic design technology assisted by means of computer.

For example, Sato (1982), of NEC, made a connectivity matrix showing the immediate prerequisite relationships between key concepts and modules and used a computer to draw a hierarchical relationship graph of the connecting key concepts and modules after performing interpretive structural modeling operations on the matrix. Other papers also studied this sort of technology for designing lesson plans.

Most of the 26 papers belonging to the instructional evaluation category concern the development of method and systems for evaluating teacher-student interactions. For example, Takeya

a means for hierarchical structuring of test items to analyze pre-post-test, differences, formative tests, concept formation process, and curriculum structure. He concluded that IRS was applicable to instruction and curriculum evaluation.

Some of the 22 papers on instructional skills concern the analysis of the effectiveness of instructional methods and skills such as communication games, free "buzz" sessions, pauses, student's critical discussion about their own test answers, and so on.

Among them, Yoshizaki (1983), of the Naruto University of Teacher Education, utilized a "Stop Video Method" to investigate teachers' decisions and found that more experienced teachers based their behavior on the instructional goals, but less experienced teachers were more influenced by student states.

Teacher's body movements, their use of the blackboard, illustrations and teaching styles were also analyzed in terms of effects on students' learning. Thirty three papers are related to practice teaching and microteaching. In these papers methods for improving instructional processes and effective teacher training are explored.

Sakamoto (1981) developed and tested a simplified microteaching strategy for pre-service teacher training for the high school level, and found that (1) feedback both by VTR and by evaluation sheet were equally effective for improving teaching performance in micro-lesson, (2) the teaching performance of "video confrontation groups in micro lessons was evaluated more favorably than that of the "no video confrontation" group by pupils during teaching practices in high schools, and (3) "video model observation" and "verbal description" during the model teaching observation were effective in obtaining greater improvement in teaching performance. He suggested that the integration of three levels of learning - behavioral, observational and conceptual - in microteaching would be the most effective way to improve instruction.

Shiga and Abe (1980) used simulation methods such as video

information, understanding and skills related to the subject training for kindergarten teachers and felt that each of three methods alone did not provide the effective experience, but as a total package they would provide the student teachers with a more useful and comprehension experience.

6.2. "Learning"

Out of 34 papers concerning "Learning ", 22 relate to children's abilities, 5 to their evaluation skill and 7 to children's behavior characteristics.

Suzuki and others (1983) constructed a series of survey items for investigating the understanding of electro-magnetic concepts in primary school children, according to the dimensional analysis of educational materials developed by Sakamoto (1979). They asked 3,200 children from 3rd to 6th grade to solve 12 common problems, and found that the average percentage of correct answers between grades was not so large. The problems which were more difficult for 5th and 6th grade children than for 4th grade were concerned with the relationship between the dimension of the copper conductor and the amount of electric current. This might be caused by confusion with the relationship between the dimensions of Nichrome line and the amount of heat generated. They also analyzed answers of 5,585 pupils to 158 problems, and found the following results: 30% of 1st grade pupils believed that a magnet should attract golden or silver colored paper and 45% believed that magnetic force should be weakened in water, 33% of 2nd grade pupils thought that a twisted conducting wire should produce less light, 30% of 3rd grade thought that after a magnet was broken into two pieces, each piece should have only one magnetic pole, and so on.

Sakamoto and others (1980) investigated methods for developing motivation for learning by questionnaires, abstracted three factors such as "activity", "cooperativeness" and "verboseness" by factor analysis, and they constructed a cubic model of study motivation. After analyzing teachers' instruction to cultivate study motivation, they abstracted seven behavioral

characteristic factors and constructed an instructional improvement check list for nurturing motivation for learning, based upon these seven factors.

Recently Sakamoto (1985) asked approximately 5,000 primary and secondary school children to answer questionnaires on study skills and study motivation. He abstracted three factors such as cognitive, human contact and searching in primary school children. Secondary school children also evidenced three factors ---namely cognitive, visual cueing and human contact. Through factor analysis, he found that goal-seeking and co-operative behavior would be useful study skills for primary school children but passive behavior such as "visual cueing" was important in secondary school children.

Sakamoto and others (1985) also conducted a study on an international comparison of student study skills. Data from over 3,000 university and college students in nine different countries were obtained for answers to three kinds of questions: 1) study motivation, 2) study skills and 3) creativity. Factor analysis elicited four study skill factors: "behavioral", "cognitive", "visual" and "searching" and four study motivation factors: "challenge", "taking initiative", "planning" and "active persistence". These were used as a basis for international comparison. Cognitive and visual study skills often showed a high correlation to study motivation factors as well as to creativity factors, but not to scholastic performance. Patterns of characteristics of each country were mutually compared using Charnoff's face method and cluster analysis. European and American data clustered together, but Japan showed a unique pattern, while China was included in American cluster.

Evaluation papers on children emphasizes methods for evaluating children's abilities, and specific behaviors such as hand-raising, group activities and seating behaviors.

Oda (1982), from Mie University, investigated seating behaviors and found the following results: (1) elementary school children had a high level of preference for seats close to the teacher, while college students had a greater tendency to like

the seats at the back of the classroom, (2) the seats judged by the students as good for listening to lectures were located between the front and middle of the classroom. Teachers have a strong preference for keeping contact with the students who sat in these areas, and (3) "A seats" which were located between the front and middle of the classroom were used by students who were strongly motivated by the lectures, "C seats" located towards the back of the classroom were used by the least motivated students.

6.3. "Media"

Ninety-four papers dealing with "Media" published during the period from 1980 to 1984, are divided into three broad categories: (1) Use of media for instruction, (2) Development of systems, hardware and materials for instruction, and (3) CMI and information retrieval for instruction.

In articles concerning the use of media, 14 are related to audiovisual devices, 6 to VTR, 14 to TV and 14 to microcomputers. For example there are studies of the effects of colors and different pointers in OHP by Suetake, effective usage of response analyzer by Fujita, the use of video camera by Shimo, and the acceptance process of two-way interactive television by Momona among the media research reports.

Four papers reported the development of and formative evaluation of instructional television programs for 2 year olds. A team consisting of TV directors, developmental psychologists and educational technologists surveyed the TV viewing behavior in 2 year olds, established educational goals, broke them down into behavioral objectives, then produced a series of pilot TV programs. The team evaluated the effects of the programs on 2 year olds by means of a microcomputerized TV viewing behavior analysis system, which overlayed graphs of real time children's attention to the TV programs. Then they analyzed the points to be improved, revised the programs, and reevaluated effects on additional 2 year olds. The revised programs gave better results. These were broadcast nationwide through the NHK TV. In this procedure several pilot TV programs and segments of

programs were produced and evaluated. For example in children's Yoga, time of segment (2.5 minutes or 5 minutes), gender (male or female), face (with beard or none), background (simple or complicated), music (monotonic or brilliant), etc. were the studied parameters. After the evaluations, effective characteristics of TV programs for 2 year olds were selected.

Shimizu (1984) studied the two way optical fibre lecture transmitting system between two campuses at 30km distance in Tokyo Institute of Technology, and to determine the effectiveness of distance teaching by student questionnaire responses.

Examples of papers on CAI research, include one on CAI frame sequencing by Noshima, CAI at a small isolated multigrade elementary school by Shimuzu, and on evaluation of instructional effectiveness by Okamoto. Ishimoto (1980), of the Internaitonal Christian University, studied verbal learning of concepts by CAI, and summarized the results as follows: (1) Behavior for selecting learning sequences was observed among two-thirds of subjects studying material with hierachical structure-matrices. This ratio is higher than the 50% who are self selecting when studying materials without hierachical structure, (2) learners began to select their sequence from basic knowledge and then selected in random fashion when studying materials without structure, and (3) a shorter average practice time for those who selected sequence than for those who studied concepts in the given order.

The study of a "Responsive Learning Environment Room" project was reported by Sugai and others (1984). This was designed to present handicapped children and preschool chidren with a media-rich learning environment, including computer-controlled video-disk technology. When children learned in this environment, they showed remarkable achievement in solving arithmetic problems and were highly motivated.

Papers concerning new systems, hardware and software are reported by many researchers. Most educational and instructional technologists in Japan seem to be interested in these topics. Examples of CMI and Information Retrieval, topics include the

construction of an educational thesaurus by Nagano, Japanese Descriptors from ERIC by Shimizu, a microcomputer database system for audio visual materials by Kikukawa, and SIS-TEM by Goto.

6.4. Subject Areas and Special Education

The application of instructional technology to subject areas, such as mathematics, science, and engineering are more frequently reported than those in other areas. In special education, systems for instructing and guiding deaf, severely and multiply handicapped children and students displaying problematic behaviors were reported.

6.5. Media Literacy

Papers dealing with film literacy by Kono, audio visual literacy by Miyake and Murakawa and computer literacy by Saeki were presented. This area of study is very important, but few studies have been undertaken so far. Two of research groups have just begun to develop curricula for computer literacy and media literacy.

7. Problems - Today and Tomorrow

One could summarize the main characteristics of instructional technology research in Japan as follows:

1. Strong efforts to develop new technologies, systems, hardware, software and courseware for instruction are widely found among educators, educational industries, universities and colleges.
2. A lot of interest exists for the use of microcomputers in instruction, and research on instructional application of new media is increasing.
3. Evaluation studies of the developed systems, hardware, software and courseware, do not generally include their effects on teaching and learning behaviors such as cognitive, affective, motivational, moral and social outcomes, although there were some. In this connection, more user friendly interfaces should also be investigated and developed, and further studies on human

abilities will be needed.

4. The instructional methods built into courseware has been changing from drill/practice and tutorial to simulation and information retrieval. This tendency is expected to continue and CAI is expected to become more intelligent.

5. Research and curriculum development of media literacy including TV literacy and computer literacy began recently, and will continue.

6. Introducing microcomputers and word processors into schools was heavily promoted in 1985 by governmental policies. This trend will be extended for a few years. More research will be needed for their effective use in education.

7. Instructional methods for cultivating instructional skills in teachers are often studied by teacher training university professors. These research activities are expected to continue.

8. In order to promote instructional technology research and practice, graduate courses for instructional technology should be established in universities and teacher training colleges. Effective instructional improvement must be expected by accumulating Instructional Technology research nationally and internationally.

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Table 1. Distribution of Microcomputers in Schools

	Word Processor	Videodisc	Microcomputer
Primary School N = 24,804 96%	1,795 7.6 %	1,558 6.6 %	483 2.0 %
Middle School N = 10,314 99%	1,458 14.3 %	736 7.2 %	1,296 12.7 %
High School N = 3,853 99%	1,764 46.1 %	298 7.8 %	3,101 81 %

Table 2. Categories of Instructional Technology Research
(Figures show approximate percentages of papers concerned)

Category	1980-1984	1985
1. Teaching	35%	30%
2. Learning	15%	5%
3. Media	35%	40%
4. Subject Area	10%	10%
5. Special Education	3%	5%
6. Media Literacy	3%	10%

(Papers in Academic Journals) (Papers in Annual Conf.)

Table 3. Means and Standard Deviations for Percentages of Items
under each Factor Evaluated as "Required" of Specialists.
(Imae et al. 1985)

Factor	School Level		University Level	
	Mean	SD	Mean	SD
Instructional Design and Research	33.2%	12.9	26.1%	10.9
Media Production and Equipment Operation	33.9	8.2	23.3	8.7
Research	24.5	12.6	55.3	10.3
Educational Systems Development and Management	19.8	6.7	23.6	10.1
Basic Knowledge of Education	14.4	7.2	23.5	11.3

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